

## PATENT SPECIFICATION

908,134

DRAWINGS ATTACHED.

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## COMPLETE SPECIFICATION.

Improvements in or relating to Apparatus for Use in Handling  
Radio-Active Materials.

We, MITCHELL ENGINEERING LIMITED, a British Company, of 1 Bedford Square, London, W.C.1, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention comprises improvements in or relating to apparatus for use in handling radio-active materials and is concerned more particularly with apparatus for handling radio-active "pencils" such as are used in testing welds in pipes or pipe-lines. A radio-active pencil may be in the form of a brass rod with a recess in one end to receive a capsule or pellet of a radio-active material, e.g. radio-active iridium, and a cap threaded on the recessed end of the rod to retain the capsule or pellet in position.

According to the invention in one aspect, there is provided the combination with a container for a radio-active pencil, which container comprises a, preferably spherical, mass of lead enclosed in a correspondingly shaped casing of steel or other suitable metal and means defining a cylindrical recess extending into the lead mass to adjacent its centre and providing a neck which projects from the casing and bounds the mouth of the recess, of a cylindrical pencil holder for receiving the pencil, the holder being slidable into the recess and having a quick release connection with the neck of the casing, and of a closure cap slidable over the neck and having a quick release connection with the container, the pencil holder and closure cap incorporating radiation shielding material.

The casing is preferably provided with a handle by which the container is carried,

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the handle either being adapted to permit the container to be carried by one person, or being adapted to permit the container to be carried by two persons.

Preferably, the quick release connections are of the bayonet type.

The invention comprises in another aspect, the combination with a pencil holder as above set forth, of a device wherein the holder is placed during use of the radio-active material, the device comprising a sleeve into which the holder is slid and to which the holder may be locked by a quick-release connection, for example a bayonet type connection, and a layer of shielding material around the sleeve, the layer extending from one end of the sleeve to adjacent the quick release connection.

The apparatus of this invention is of simple construction and simplifies handling, especially when the radio-active material is to be used at a point which is difficult of access.

One preferred form of the above and other features of invention will now be described with reference to the accompanying drawings in which:—

Figure 1 illustrates a radio-active pencil;

Figure 2 illustrates in section a pencil holder in a container;

Figure 3 illustrates the pencil holder, parts being in section;

Figure 4 illustrates a saddle for use with the pencil holder; and

Figures 5 and 6 illustrate in elevation and plan respectively a carrier box in which the apparatus may be stored.

The apparatus is for use with a radio-active pencil (Figure 1) of about  $5\frac{1}{2}$  inches length and  $\frac{1}{2}$  inch diameter comprising a

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brass rod 10 having a threaded recess 11 at one end for attachment of handling rods when required and a recess 12 in the opposite end to receive a radio-active capsule, say a standard British iridium capsule of up to 1000 millicuries, and this recess is closed by a cap nut 13 threaded on the end of the rod. A peripheral V-shaped groove 14 is formed in the rod adjacent its end having the threaded recess.

The apparatus comprises a container C, a pencil holder H which has the pencil in it and which is stored in the container, and a saddle S in which the holder is fitted during inspection of said welds in pipes.

The pencil holder (Figures 2 and 3) comprises a pair of stainless steel cylinders 15, 16 having a length of about  $5\frac{1}{2}$  inches and having about  $\frac{1}{2}$  inch and  $1\frac{1}{4}$  inch internal diameters respectively, the cylinders secured together at one end by an annular plug 17 which is inserted between the cylinders and welded to them. The space between the cylinders is filled with lead 18, the filling being free from cavities and inclusions. The bore 19 of the smaller cylinder houses the pencil and a grub screw 20 extends through the plug 17 to engage the V-shaped groove 14 and hold the pencil in position. The holder is also provided between its ends with a pair of diametrically opposite externally-projecting pins 21 forming one part of a bayonet type connection. The holder H provides sufficient protection to enable it to be handled for short periods, for instance during transfer from the container C to the saddle S.

The container (Figure 2) comprises a 5 inch diameter mild steel sphere 25 which is filled with lead 26, the filling being free from cavities or inclusions. A  $1\frac{1}{2}$  inch diameter cylindrical recess is formed in the sphere, the recess extending to just beyond the centre of the sphere and this recess has fitted in it a stainless steel tube 27 about  $4\frac{1}{2}$  inches long. The end of the tube at the bottom of the recess is closed and the opposite end projects from the sphere 25 to form a neck which has in it a pair of diametrically-opposite slots 28. Each slot 28 is of Z-form having two portions parallel to the tube axis joined by a circumferential portion, one of the two portions extending to the end of the neck.

These slots 28 provide the second part of the bayonet type connection and the pencil holder H slides into the tube 27 and is locked in position by engaging the pins 21 on the holder H with the Z-form slots 28. When the holder H is fully home in the tube 27, the end remote from the radio-active capsule projects from the neck.

An axially narrow collar 29 of somewhat larger diameter than the tube 27 is welded to the sphere coaxially with the tube, the space between the collar and tube being

filled with lead 30, and the collar 29 is provided with a pair of diametrically opposite radially-projecting pins 31 forming part of a second bayonet type connection.

The container C also comprises a closure cap comprising a pair of stainless steel cylindrical cups 34, 35 each closed at one end. The cup 34 is of such dimensions as to fit with a clearance over the neck formed by the projecting part of the tube 27 and the projecting end of the holder H and the cup 35 is larger and of such diameter as to be a push fit over the collar 29. The cups are one inside the other and the space between their walls and bases is filled with lead 36. At their open ends, the outer cup 35, projects beyond the lead filling 36 and the inner cup 34, and this portion of the outer cup has in it diametrically opposite L-shaped slots 37 which form a part of the second bayonet type connection and are engaged by the pins 31 when the cap is fitted in position.

The container C also has a base formed by a mild steel skirt 38 welded to the sphere 25 coaxially with, but diametrically-opposite to the collar 29.

A pair of bifurcated lugs 40 are welded to the sphere 25, one to each side of the collar 29 and a stout wire bail 41 is pivoted to the lugs 40 by stainless steel rivets 42 passing through the lugs and eyes at the ends of the bail 41. The bail provides a carrier handle and has a wooden grip 43.

In order to allow the cap 35 to be locked to the sphere 25, the bail 41 and cap 35 have welded to them lugs 44, 45 which, when the cap is in position and the bail is upright, overlap to bring holes 46 in them into register to receive the hasp of a padlock.

The saddle S (Figure 4), in which the pencil holder H is fitted during inspection of a part such as a pipe weld, comprises an inner open-ended tube 50 surrounded at one end by an outer tube 51 of substantially larger diameter, the space between them being filled with lead 52. The projecting portion 50a of the inner tube 50 has cut in it diametrically-opposite L-slots 53 for engagement bayonet-wise by the pins 21 in the pencil holder H. The outer tube 51 has a pair of diametrically-opposite slotted lugs 54 to permit the attachment of straps by which the saddle 8 is held in position during inspection of a pipe and has shallow V-shaped notches 55 in its end to enable the saddle to sit firmly on the curved wall of the pipe.

In use of the above apparatus, the container C is carried as close as possible to the point of inspection, the recording film and saddle S, if being used, are secured in position on the part to be inspected, the cap 35 is unlocked and removed from the container C, the pencil holder H containing the pencil is withdrawn from the container C and

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inserted in the saddle S which operation can be done quickly even at points of difficult access, and after the appropriate exposure time the holder H is transferred back to the container C or to a further saddle S. When the saddle is not required, for example when the pencil is inserted into a pipe, a handling rod is attached to the pencil which can then be removed from the holder.

10 It will be appreciated that the apparatus is of very simple construction and easy to use even in positions of difficult access, and yet it affords adequate protection to the user.

When not in use the apparatus may be housed in a carrier box (Figures 5 and 6) having a main body 60 and a deep two-part lid 61, 62. The main body 60 is of mild steel and has a wooden block 63 secured inside it to its bottom by a suitable adhesive. The block 63 has a centrally disposed recess 64 to receive the skirt 38 on the sphere 25 of the container C. The lid is also of mild steel and the two halves 61, 62 are pivotally secured to opposite upper edges of the main body 60 by stainless steel hinges 66. The part 61 of the lid has an inwardly joggled flange 67 which is overlapped by the part 62 when the lid is closed. The part 61 has a series of lugs 68 upstanding from its upper surface adjacent the joggled edge, and the part 62 has a corresponding series of upstanding lugs 69 which also project laterally from the lid part so that, when the lid is closed, holes in the two series of lugs 68, 69 are aligned to receive a locking pin 70 having an abutment head 71 at its end and a hole 72 to receive a padlock at its other end.

Each lid half is provided internally with spring clips 73 to receive the saddles S. Rubber cushions are provided at appropriate points in the box.

#### WHAT WE CLAIM IS:—

1. The combination with a container for a radio-active pencil, which container comprises a mass of lead enclosed in a correspondingly shaped casing of steel or other suitable metal and means defining a cylindrical recess extending into the lead mass to adjacent its centre and providing a neck which projects from the casing and bounds the mouth of the recess, of a cylindrical pencil holder for receiving the pencil, the holder being slidable into the recess and having a quick release connection with the neck of the casing, and of a closure cap

slidable over the neck and having a quick release connection with the container, the pencil holder and closure cap incorporating radiation shielding material.

2. The combination according to Claim 1, wherein the casing of the container is spherical.

3. The combination according to Claim 1 or Claim 2, wherein the means defining the recess is a steel tube which is closed at its end adjacent the centre of the lead mass filling the casing and projects from the casing at its other end to form the neck, the quick release connection being formed by bayonet slots in the tube and pins on the holder.

4. The combination according to Claim 3, wherein the casing has a collar encircling the neck and the closure cap is a push fit on the collar, there being a bayonet connection between the cap and collar.

5. The combination according to any of Claims 1 to 4, wherein the holder comprises a pair of tubes, one within the other, the space between them being lead filled and there being means to hold the pencil within the bore of the inner tube.

6. The combination according to any of Claims 1 to 5 further comprising a device wherein the holder is placed during use of the radio-active material, the device comprising a sleeve into which the holder is slid and to which the holder may be locked by a quick release connection, for example a bayonet type connection, and a layer of shielding material around the sleeve, the layer extending from one end of the sleeve to adjacent the quick release connection.

7. The combination substantially as hereinbefore described with reference to and as illustrated in Figures 2 and 3 of the accompanying drawings.

8. The combination according to Claim 7 further comprising a saddle substantially as hereinbefore described with reference to and as illustrated in Figure 4 of the accompanying drawings.

9. The combination according to Claim 7 or Claim 8, further comprising a carrier box substantially as hereinbefore described with reference to and as illustrated in Figures 5 and 6 of the accompanying drawings.

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#### PROVISIONAL SPECIFICATION.

#### Improvements in or relating to Apparatus for Use in Handling Radio-Active Materials.

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invention to be described in the following statement:—

This invention comprises improvements

in or relating to apparatus for use in handling radio-active materials and is concerned more particularly with apparatus for handling radio-active "pencils" such as are used in testing welds in pipes or pipe-lines. A radio-active pencil may be in the form of a capsule or pellet of a radio-active material, e.g. radio-active iridium, and a cap threaded on the recessed end of the rod to retain the capsule or pellet in position.

According to the invention in one aspect, there is provided the combination with a radio-active pencil comprising a, preferably spherical, mass of lead enclosed in a correspondingly shaped casing of steel or other suitable metal and means defining a cylindrical recess extending into the lead mass to adjacent its centre and providing a metal neck which projects from the casing and bounds the mouth of the recess, of a cylindrical pencil holder for receiving the pencil, the holder being slidable into the recess and having a quick release connection with the neck of the casing, and of a closure cap slidable over the neck and having a quick release connection with the container, the pencil holder and closure cap incorporating radiation shielding material.

The casing is preferably provided with a handle by which the container is carried, the handle either being adapted to permit the container to be carried by one person, or being adapted to permit the container to be carried by two persons.

Preferably, the quick release connections are of the bayonet type.

The invention comprises in another aspect, the combination with a pencil holder as above set forth, of a device wherein the holder is placed during use of the radio-active material, the device comprising a sleeve into which the holder is slid and to which the holder may be locked by a quick release connection, for example a bayonet type connection, and a layer of shielding material around the sleeve, the layer extending from one end of the sleeve to adjacent the quick release connection.

The apparatus of this invention is of simple construction and simplifies handling, especially when the radio-active material is to be used at a point which is difficult of access.

One preferred form of the above and other features of invention will now be described.

The apparatus is for use with a radio-active pencil of about  $5\frac{1}{2}$  inches length and  $\frac{1}{2}$  inch diameter comprising a brass rod having a threaded recess at one end for attachment of handling rods when required and a recess in the opposite end to receive a radio-active capsule, say a standard British iridium capsule of up to 1000 milli-

curies, and this recess is closed by a cap nut threaded on the end of the rod. A peripheral V-shaped groove is formed in the rod adjacent its end having the threaded recess.

The apparatus comprises a container, a pencil holder which has the pencil in it and which is stored in the container, and a saddle in which the holder is fitted during inspection of said welds in pipes.

The pencil holder comprises a pair of stainless steel cylinders having a length of about  $5\frac{1}{2}$  inches and having about  $\frac{1}{2}$  inch and  $1\frac{1}{2}$  inch internal diameters respectively, the cylinders secured together at one end by an annular plug which is inserted between the cylinders and welded to them. The space between the cylinders is lead filled, the filling being free from cavities and inclusions. The bore of the smaller cylinder houses the pencil and a grub screw extends through the plug to engage the V-shaped groove and hold the pencil in position. The holder is also provided between its ends with a pair of diametrically opposite externally-projecting pins forming one part of a bayonet-type connection. The holder provides sufficient protection to enable it to be handled for short periods, for instance during transfer from the container to the saddle.

The container comprises a 5 inch diameter mild steel sphere which is lead filled, the filling being free from cavities or inclusions. A  $1\frac{1}{2}$  inch diameter cylindrical recess is formed in the sphere, the recess extending to just beyond the centre of the sphere and this recess has fitted in it a stainless steel tube about  $4\frac{1}{2}$  inches long. The end of the tube at the bottom of the recess is closed and the opposite end projects from the sphere to form a neck which has in it a pair of diametrically-opposite slots. Each slot is of Z-form having two portions parallel to the tube axis joined by a circumferential portion, one of the two portions extending to the end of the neck.

These slots provide the second part of the bayonet type connection and the pencil holder slides into the tube and is locked in position by engaging the pins on the holder with the Z-form slots. When the holder is fully home in the tube, the end remote from the radio-active capsule projects from the neck.

An axially narrow collar of somewhat larger diameter than the tube is welded to the sphere coaxially with the tube, the space between the collar and tube being lead filled, and the collar is provided with a pair of diametrically opposite radially-projecting pins forming part of a second bayonet type connection.

The container also comprises a closure cap comprising a pair of stainless steel cylindrical cups each closed at one end.

One cup is of such dimensions as to fit with a clearance over the neck and the projecting end of the holder and the other cup is larger and of such diameter as to be a push fit over the collar. The cups are one inside the other and the space between their walls and bases is lead filled. At the open end of the cup, the outer cup projects beyond the lead filling and the inner cup, and this portion of the outer cup has in it diametrically opposite L-shaped slots which form a part of the second bayonet type connection and are engaged by the pins on the collar when the cap is fitted in position.

The container also has a base formed by a mild steel skirt welded to the sphere coaxially with, but diametrically-opposite to the collar.

A pair of bifurcated lugs are welded to the sphere, one to each side of the collar and a stout wire bail is pivoted to the lugs by stainless steel rivets passing through the lugs and eyes at the ends of the bail, the bail provides a carrier handle and has a wooden grip.

In order to allow the cap to be locked to the sphere, the bail and cap have welded to them lugs which, when the cap is in position and the bail is upright, overlap to bring holes in them into register to receive the hasp of a padlock.

The saddle, in which the pencil holder is fitted during inspection of a part such as a pipe weld, comprises an inner open-ended tube surrounded at one end by an outer tube of substantially larger diameter, the space between them being lead filled. The projecting portion of the inner tube has cut in it diametrically-opposite L-slots for engagement bayonet-wise by the pins in the pencil holder. The outer tube has a pair of diametrically-opposite slotted lugs to permit the attachment of straps by which the saddle is held in position during inspection of a pipe and has shallow V-shaped notches in its end to enable the saddle to sit firmly on the curved wall of the pipe.

In use of the above apparatus, the container is carried as close as possible to the point of inspection, the recording film and saddle, if being used, are secured in position

on the part to be inspected, the cap is unlocked and removed from the container, the pencil holder containing the pencil is withdrawn from the container and inserted in the saddle which operation can be done quickly even at points of difficult access, and after the appropriate exposure time the holder is transferred back to the container or to a further saddle. When the saddle is not required, for example when the pencil is inserted into a pipe, a handling rod is attached to the pencil which can then be removed from the holder.

It will be appreciated that the apparatus is of very simple construction and easy to use even in positions of difficult access, and yet it affords adequate protection to the user.

When not in use the apparatus may be housed in a carrier box having a main body and a deep two-part lid. The main body is of mild steel and has a wooden block secured inside it to its bottom by a suitable adhesive. The block has a centrally disposed recess to receive the skirt on the sphere of the container. The lid is also of mild steel and the two halves are pivotally secured to opposite upper edges of the main body by stainless steel hinges. One half of the lid has an inwardly joggled flange which is overlapped by the other half lid when the lid is closed. The one half of the lid has a series of lugs upstanding from its upper surface adjacent the joggled edge, and the other half has a corresponding series of upstanding lugs which also project laterally from the lid half so that, when the lid is closed, holes in the two series of lugs are aligned to receive a locking pin having an abutment head at its end and a hole to receive a padlock at its other end.

Each lid half is provided internally with spring clips to receive the saddles. Rubber cushions are provided at appropriate points in the box.

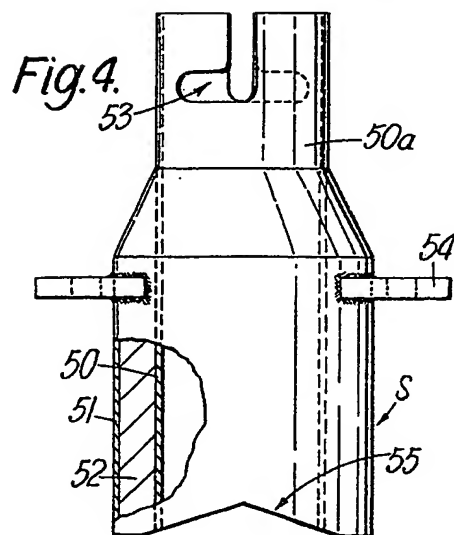
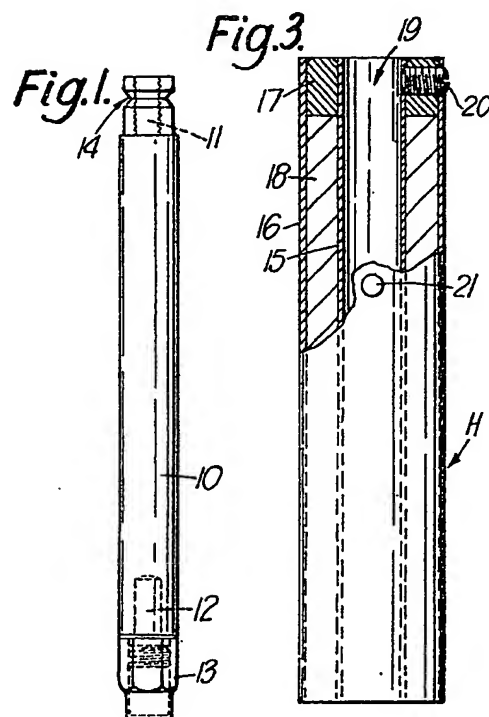
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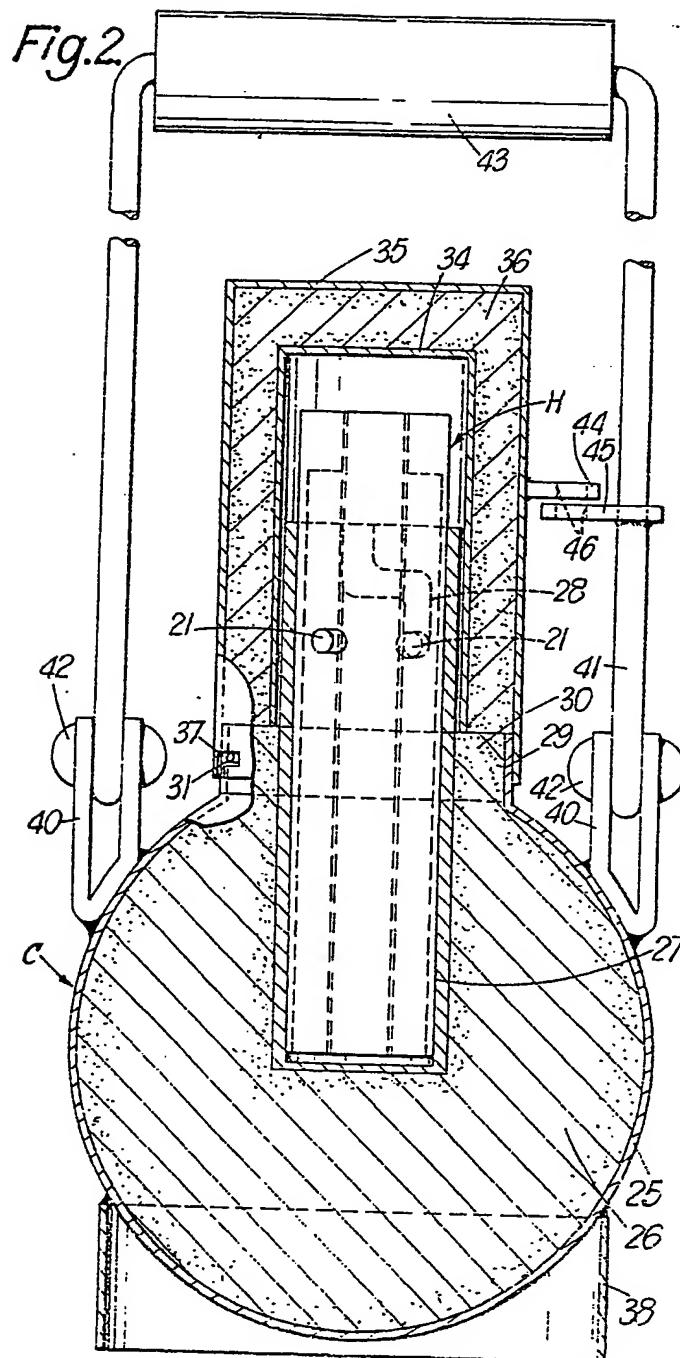
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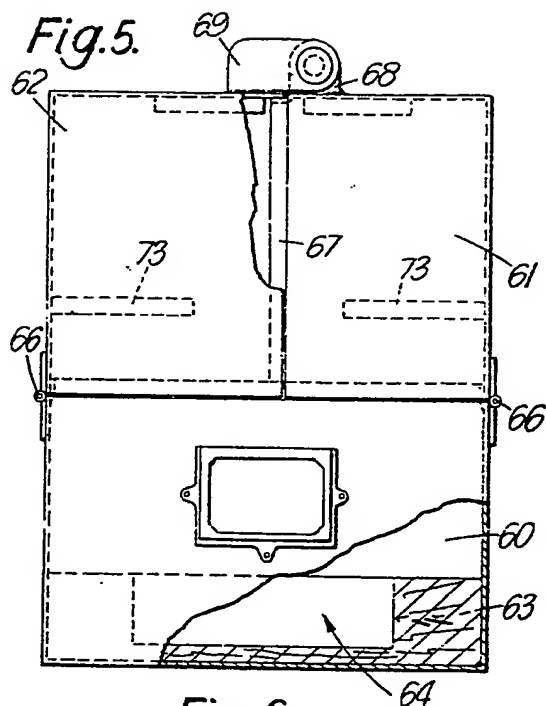
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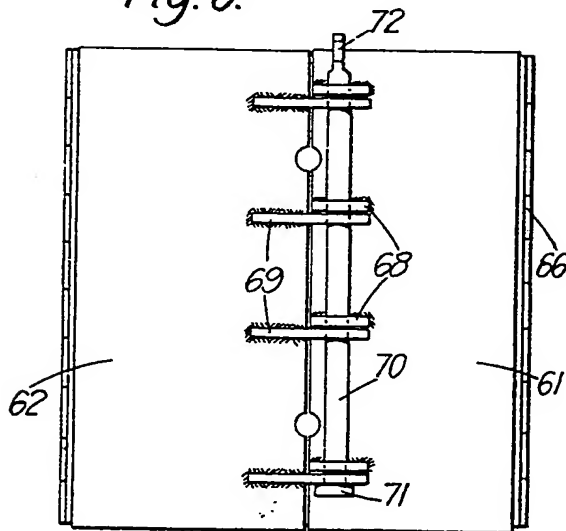




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SHEETS 2 & 3



*Fig. 6.*





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SHEETS 2 & 3

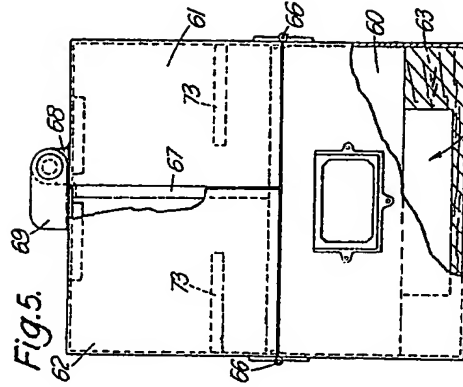
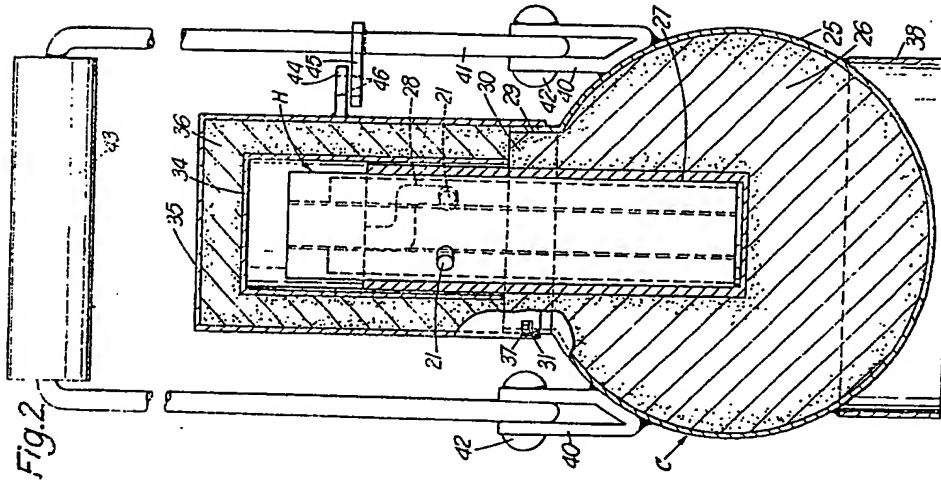
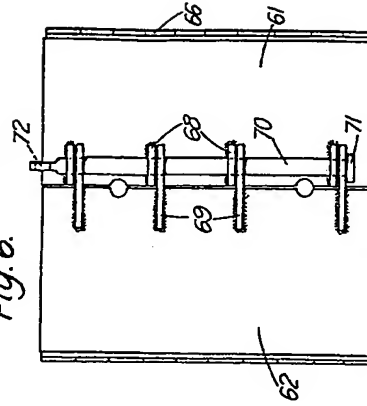


Fig. 6.



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